LG SF6 Load Break Switches

For 600A and 200A underground Power Distribution System of 15kV through 38kV

- Feature
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LG SF_6 Load Break Switches

For 600A and 200A underground Power Distribution System of 15kV through 38kV

LG Industrial Systems Co., Ltd.

FOR UNDERGROUND

SF6 LOAD BREAK SWITCHES

We give you reliable, compact, high-density

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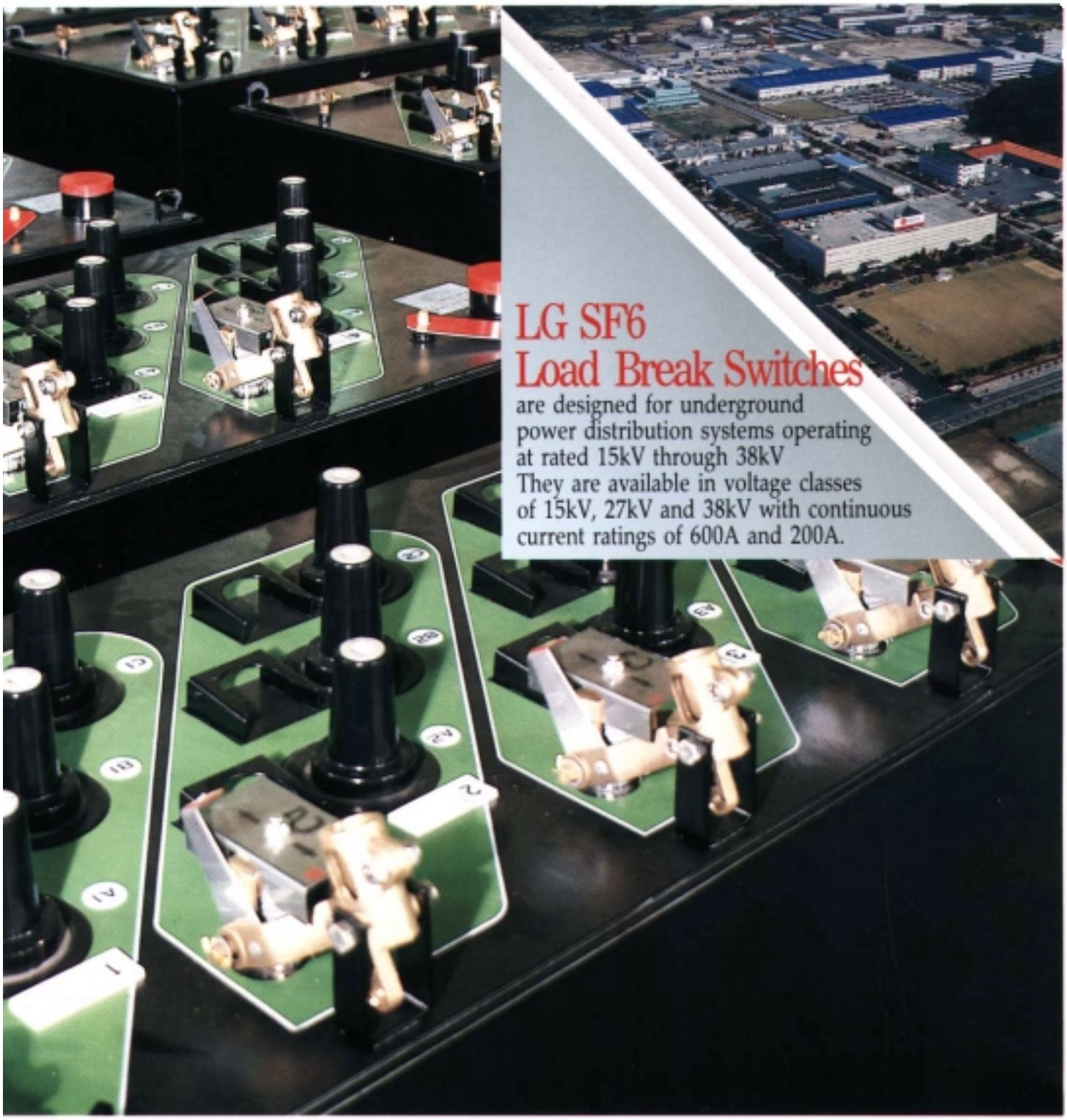
DISTRIBUTION SYSTEMS ···



LG SF6 Load Break Switches

are designed for underground power distribution systems operating at rated 15kV through 38kV
They are available in voltage classes of 15kV, 27kV and 38kV with continuous current ratings of 600A and 200A.

witches for underground distribution applications.

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SF_6 LOAD BREAK SWITCHES

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Features

SF6 insulation

- Combined with puffer technology to give switches patented puffer power wtithout the need for external stored source of SF6.
- Arcing in SF6 does not create conductive deposits or create explosive gasses.
- Non-flammable characteristics permits use in vaults, buildings, mines, refineries with added safety.
- Reduces weight of switches, mount in any position.
- No need for fire-proof construction or precautions for drainage and ventilation.

Padmount Enclosure

- Switch housed in separate stainless steel tank.
- Padmount enclosure surrounds switch giving easy installation and double wall protection.
- Padmount enclosure 12 gage mild steel with smooth corners, tamper resistant.
- All external hardware stainless steel.
- Padlockable access to switch.
- Includes lifting and mounting provisions.

Tank and accessories

- All stainless steel welded tank construction.
- Tank sides bottom 12 gage stainless steel.
- Tank top operating panel 3/16" thick stainless steel.
- Two welded lifting eyes, one inch in diameter, on opposite corners.
- Entire switch tank cleaned and coated with an 8-milthick coating of coal tar epoxy for maximum corrosion protection.
- Tank and all components T.I.G. welded to assure leaktight construction.
- Tank with components welded in place extensively tested for leakage with Helium mass spectrometer to assure minimum 30 year life.
- Brass filling valve and cap for adding SF6 gas in field, if required.
- 15 PSI pressure gage with red color coding and operation caution tag below 2 PSI.
- Color coded pressure gage housed and encapsulated by a protective tube and shipped with a protective shipping cap.
- 1/2"~13 threaded ground provisions and clamp type lug for grounding tank and cable entrances.
- All external components and accessories are stainless steel or bronze for corrosion resistant submersible applications.

Operating mechanisms

- Manual operating handles included with switch.
- Operating handles may be permanently attached or removed.
- Operating handles clearly marked for direction of travel to open or close switch.
- Operating handles have provisions for rope or hookstick operation.
- Stainless steel nameplate, line diagram and phase identification tags give operating and rating information.
- Operating shafts enter sealed tank thru welded stainless steel bellows
- Operating shafts are protected externally by rubber boot insuring proper operation without dirt accumulation.

Cable entrances

- Oriented to provide easy cable training and connection of elbows.
- Identified by phase tags and line diagram nameplate.
- Elbows and accessories required for cable installation furnished by user
- Bushings are welded direct to tank operating panel and includes an internal secondary sealant to prevent loss of gas pressure.
- Protective shipping caps included with each bushing.

Puffer power plus

- Power puffer design capitalizes on the presence of SF6 insulation in the switch to actively increase performance and ratings to give longer life, extra safety margins and increased reliability.
- The puffer action is self generating and requires no external stored source of SF6.
- During contact opening the movement of the contact and surrounding puffer cone compresses the SF6 captured in the puffer tube and forces it at high pressure through the contact area.
- Any arcing occuring in the contact area is confined to the arcing tips constructed of tungsten copper and is quickly extinguished in 1/2 cycle or less.

Design Feature and Structure

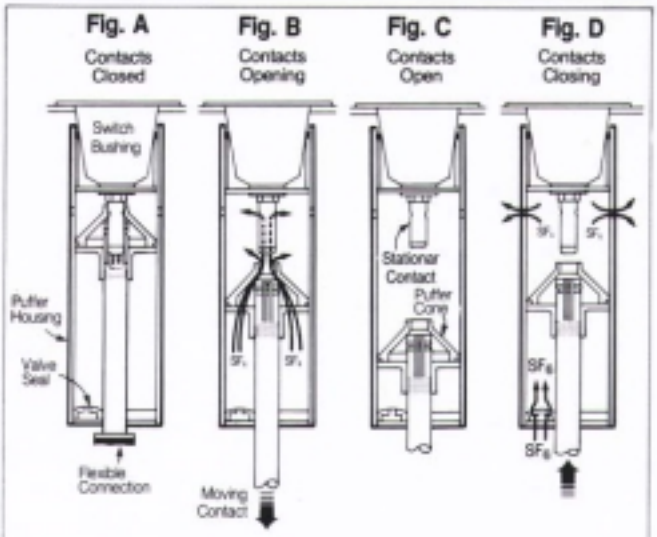
Switch description

Switches are rugged, compact and deadfront. They are designed and constructed to provide an economical, safe and reliable means of switching in a small, light weight package. The switches use SF6 as the insulating and arc-interrupting medium eliminating the weight, potential hazards and maintenance costs often associated with oil filled equipment. Units can be mounted in any position in virtually any location including Class 1, Division 1 Hazardous locations. They are available in subsurface as well as padmount designs in a variety of circuit configurations.

Switch assemblies are housed in a sealed, corrosion resistant, stainless steel tank which contains the SF6 insulation and provides protection for the internal working parts. A coating applied to the completed unit provides additional corrosion prtection.

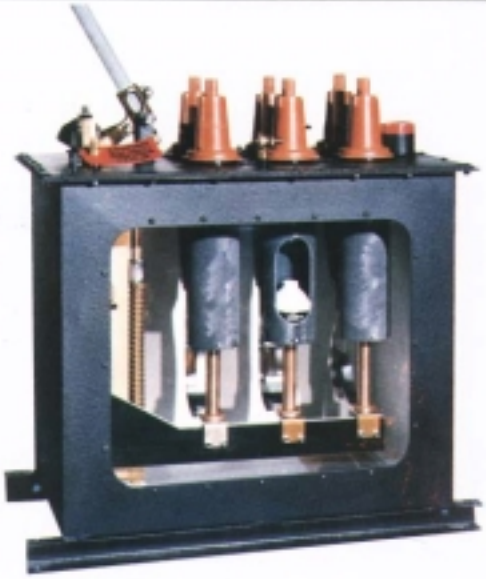
Cable connection bushings, operating handles, grounding lug, switch postion indicators, pressure gage, fill valve, nameplates and phase identification are mounted on a 3/16" stainless operating panel which is welded to the tank. The nameplates and phase identification tags are etched stainless steel. All other exposed hardware is bronze.

Puffer action

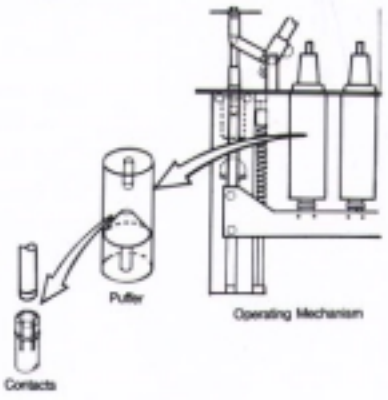


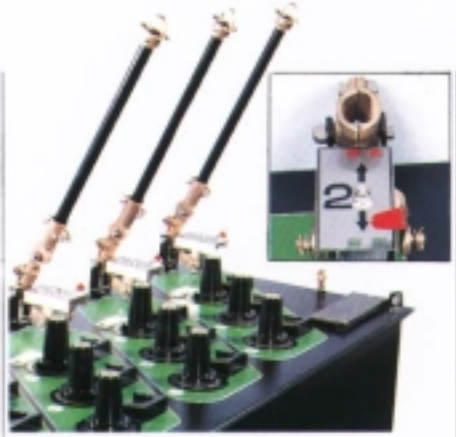
Contact movement creates the puffer action which momentarily increases the dielectric strength and arc-extinguishing properties of SF6 at the time it is needed during load break switching. During contact opening (Fig. B), the puffer action forces a pressurized stream of SF6 through the contact area, cooling and extinguishing the arc at the first current zero.

During contact closure (Fig.D), the puffer cone compresses the column of SF6 ahead of the contact, eliminating pre-strike contact damage. In the full-open position (Fig. C), a three-inch gap provides 200kV Bil withstand and permits DC testing.



Inside the switch, insulated puffer tubes house the switch contacts. A positive-latch, spring mechanism opens and closes the contacts at a high rate of speed independent of the speed of movement of the operating handle. Flexible, tin plated copper bus connect the contacts in the desired circuit configuration.





Switch operating handles
may be actuated by hooksick or rope. Handles can be permanently installed, or removed and stored. Operating handle movement is clearly labeled and provides positive position indication. Padlock provisions allow locking in either the open or closed positions.

All welded switch construction
is standard, eliminating gaskets and O-ring seals for leak-tight, maintenance-free service. Bushings are T.I.G. welded to the switch tank; following that a secondary sealant is applied to the internal mating surface to provide additional sealing protection. Operating shafts are sealed by an internal, flexible, stainless steel bellows and equipped with an external protective boot.

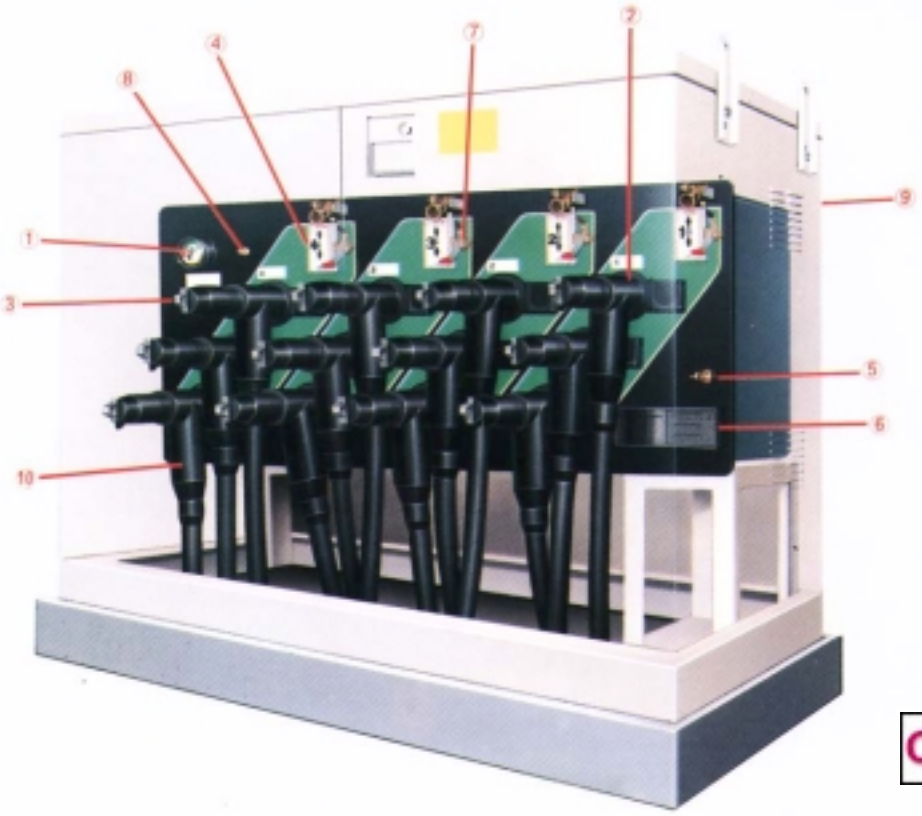
* bushing

* bellows

Pressure gage
is color-coded for easy reading of correct pressure and operating range. Mechanical protection is provided by a surrounding protective tube filled with clear sealant.

Brass fill valve
sealed and protected by a threaded brass cap, operates similarly to a tire valve and provides access for filling or addition of SF6.

Bronze ground lug
provides quick, convenient connection of tank and cable to system ground.



① Color coded gas pressure guages
② Welded 600A apparatus bushings for use with standard ANSI separable connectors.
③ Insulating receptacle
④ "Open" or "Closed" positive position identification
⑤ Grounding lug
⑥ Nameplate with schematic diagram
⑦ An internal corrosion resistant flexible bellows
⑧ SF_6 gas filling valve and sealing cap
⑨ Enclosure
⑩ Load break grounding elbow

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SF_6 LOAD BREAK SWITCHES

Specifications

Voltage withstand tests and performance

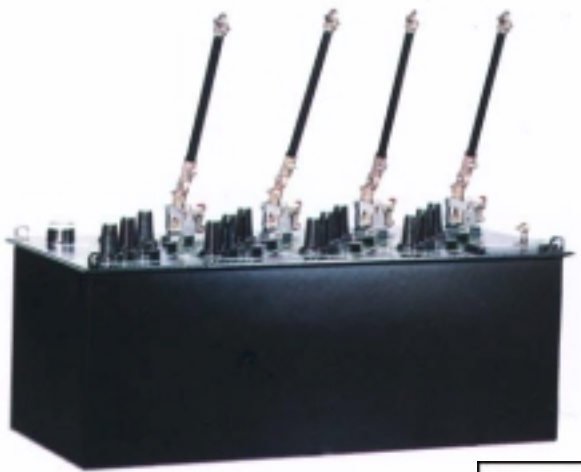
Switches were tested phase to phase, phase to ground and across open contacts with the tank and any unenergized terminals grounded. Acceptable performance was based on the ability of the switch to withstand the voltage levels shown without flashover, failure or electrical deterioration. Tests were conducted at normal operating pressure (5 PSI) and reduced operating pressure (0 PSI).

Current withstand tests and performance

Switches were tested three phase at maximum design voltage. Tests were conducted at normal operation pressure (5 PSI) and reduced (0 PSI) pressure. Acceptable performance was based on the ability of the switch to interrupt load currents at the first current zero, without any prolonged arcing and to withstand multiple short-circuit momentaries and fault-close operations without significant contact erosion or damage. Afterwards, these switches were subjected to continuous current tests (without exceeding standard temperature rate limitations), and voltage and mechanical withstand tests without any change in performance.

Mechanical tests and performance

Switches were tested to determine the mechanical endurance of the design. Acceptable performance was based on the ability to withstand the tests shown without significant wear, loosening of fasteners, leakage of gas, or otherwise impairing normal operation.



Voltage Ratings			
Maximum Design Voltage	15.5kV	27kV	38kV
Frequency	50/60Hz	50/60Hz	50/60Hz
BIL impulse withstand	95kV	125kV	150kV
One minute AC withstand	35kV	60kV	70kV
Fifteen minute DC withstand	66kV	96kV	103kV
Corona extinction	11kV	19kV	26kV
Open Gap BIL Flashover withstand	200kV	200kV	200kV

Current Ratings			
Load interrupting and loop switching	600A	600A	600A
Transformer magnetizing interrupting	25A	25A	25A
Capacitor or cable charging interrupting	40A		
Asymmetrical momentary and 3 operation fault close	19,200A	19,200A	19,200A
Symmetrical one second rating	12,000A	12,000A	12,000A
Continuous current	600A	600A	600A
8 hour overload current	900A	900A	900A
10 operation overload interrupting capability	2,500A	3,000A	2,000A
Operations-600A load interrupting endurance	1,000	1,000	1,000
Symmetrical 10 cycle phase to phase simulated internal fault withstand	12,000A	12,000A	12,000A

Application Information and Mechanical Ratings	
Construction : Submersible, non-venting, corrosion resistant, dead front	
Sealing systems:	10^{-5}cc/second maximum gas leakage
Ambient temperature range:	−40 to + 120 degrees fahrenheit
SF6 gas:	Non-toxic, non-flammable, colorless, odorless
Corrosion resistance per ASTM B-117:	2000 hours minimum
Mechanical endurance:	Earthquake, vibration, impact tested
Mechanical life:	10,000 operations
SF6 gas normal operating pressure range:	5 PSIG
Maximum design pressure for tank and fittings:	55 PSIG

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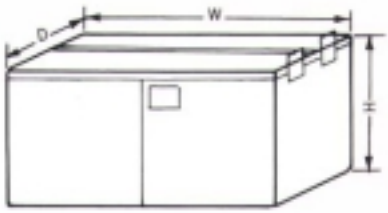
Ordering Information



Switch Configuration	Type Number	Installation	Dimension(mm) * Width	Height	Depth	Weight (Kg)
600A 600A 600A 600A 4Way-4Switched	GGP-44/60-12/24HD	Padmount	1600	1300	1200	650
	GGP-44/60-15/24HD	Subsurface	1600	1300	1200	650
	GGP-44/60-12/24HDD	Vault	1600	1300	1000	600
	GGP-44/60-15/24HDD	Submersible	1600	1300	1000	600
600A 600A 200A 600A 4Way-4Switched	GGP-44-1T/60-12/24HD	Padmount	1600	1300	1200	650
	GGP-44-1T/60-15/24HD	Subsurface	1600	1300	1200	650
	GGP-44-1T/60-12/24HDD	Vault	1600	1300	1000	600
	GGP-44-1T/60-15/24HDD	Submersible	1600	1300	1000	600
600A 200A 200A 600A 4Way-4Switched	GGP-44-2T/60-12/24HD	Padmount	1600	1300	1200	650
	GGP-44-2T/60-15/24HD	Subsurface	1600	1300	1200	650
	GGP-44-2T/60-12/24HDD	Vault	1600	1300	1000	600
	GGP-44-2T/60-15/24HDD	Submersible	1600	1300	1000	600
600A 600A 600A 3Way-3Switched	GGP-33/60-12/24HD	Padmount	1600	1300	1200	580
	GGP-33/60-15/24HD	Subsurface	1600	1300	1200	580
		Vault				
		Submersible				
600A 200A 600A 3Way-3Switched	GGP-33-1T/60-12/24HD	Padmount	1600	1300	1200	580
	GGP-33-1T/60-15/24HD	Subsurface	1600	1300	1200	580
		Vault				
		Submersible				
600A 600A 600A 600A 4Way-2Switched	GGP-42/60-12/24HD	Padmount	1600	1300	1200	650
		Subsurface				
		Vault				
		Submersible				
600A 600A 600A 3Way-2Switched	GGP-32/60-12/24HD	Padmount				
		Subsurface				
		Vault				
		Submersible				
600A 600A 2Way-1Switched	GGV-21/60-12/24HD	Padmount				
		Subsurface				
		Vault				
		Submersible				

* For padmount dimension

GGP **44** / **60** – **12** / **24** **H** **D** **P**

- **GGP**: LG Gas Insulated Load Break Switch
- **44**: Switch Configuration
  - 44 : 4way-4switch
  - 33 : 3way-3switch
  - 42 : 4way-2switch
  - 21 : 2way-1switch
  - 32 : 3way-2switch
  - 44-2T : 4way-4switch 200A 2 Tap
  - 44-1T : 4way-4switch 200A 1 Tap
  - 33-1T : 3way-3switch 200A 1 Tap
- **60**: Rated Current
  - 60 : 600A
- **12**: Impulse withstand Voltage
  - 12 : 125kV BIL
  - 15 : 150kV BIL
- **24**: Rated Voltage
  - 15 : 15.5kV
  - 24 : 25.8kV
  - 36 : 38kV
- **H**: Operating Style
  - H : Manual operation
  - M : Motor operation
- **D**: Receptacle Type
  - D : Stick-operable style
  - DD : Dead-break style
- **P**: Installation
  - P : Padmount
  - S : Subsurface
  - V : Vault
  - M : Submersible

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Stick-operable 600 Amp. Connector Systemes

The elastimold® Stick-operable connector system resolves both your power-circuit termination problems, and your concerns for operator safety, in a wide variety of deadfront-type electrical apparatus, operating at potentials up to 35 kilovolts. Installed on apparatus, this remarkably convenient system permits you to take full advantage of the greater safety inherent in deadfront construction, with its reduced space requirements-a particular significant factor at the higher voltage levels.

These "hot-stick"-operated systems have been designed around our field-proven 600-ampere deadbreak power connectors, which have been employed successfully on underground distribution systems. They give you the same reliable current-carrying connection, plus the freedom and flexibility of using these connectors as operating points: repair, maintenance and circuit-expansion work can be performed with minimal service interruptions, and, as you will see, with new high degrees of protection for personnel and equipment.

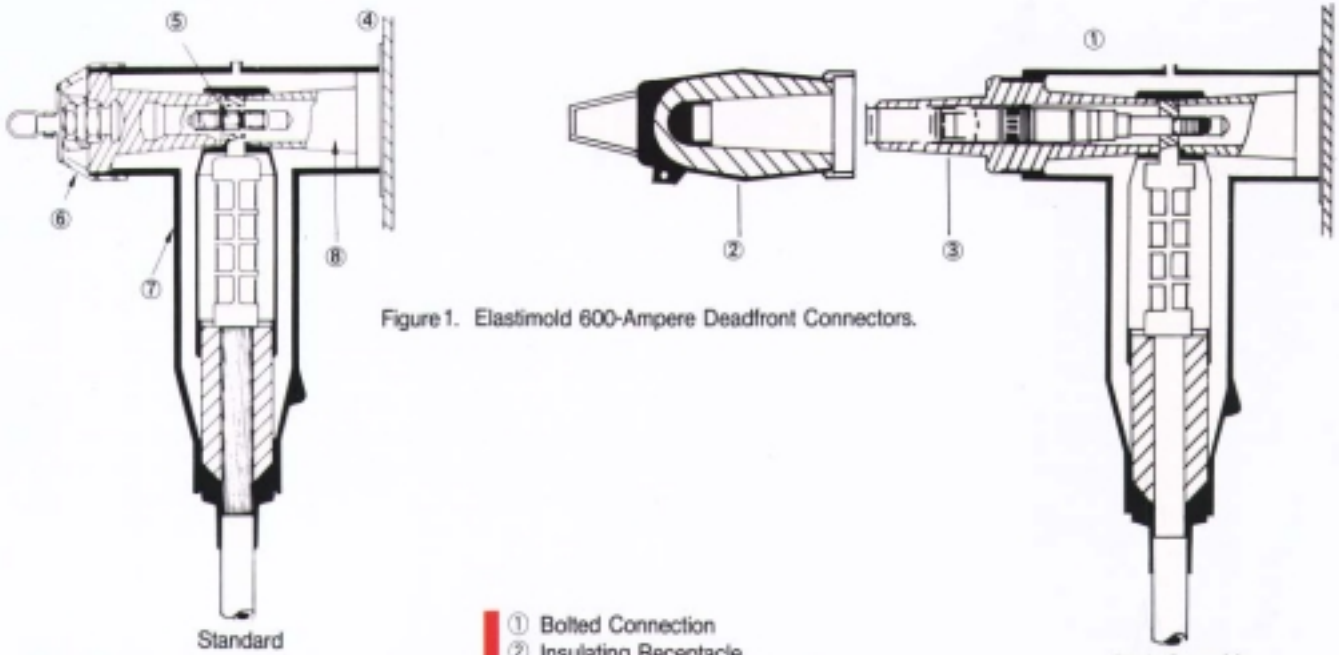

Figure 1. Elastimold 600-Ampere Deadfront Connectors.

① Bolted Connection
② Insulating Receptacle
③ Loadbreak Reducing Tap Plug
④ Apparatus Sidewall
⑤ Bolted Connection
⑥ Shielded Insulation Cap
⑦ 600-Amp Elbow
⑧ Apparatus Bushing

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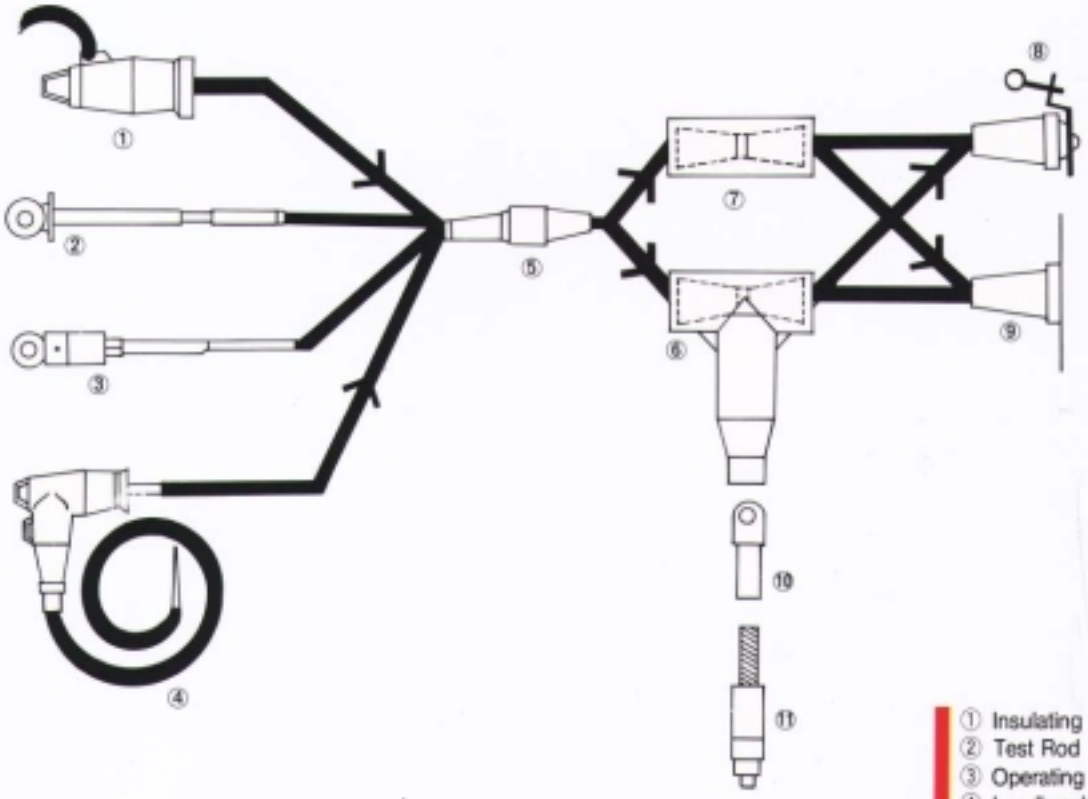
Figure 1 shows, on the left, a cross-sectional view of a standard 600-amp deadfront cable connector, assembled to the mating bushing on a piece of apparatus. When the connector is completely installed and tightened, it can perform its current carrying function in a fully insulated and shielded mode. The connector is designed to be separable, but is separated very intrequently—when the apparatus is to be replaced, or the cable system is to be dismantled and a revised system installed, for example. Both the apparatus bushing and cable must be de-energized before the cable connectors can be separated.

The growing interest in using these 600-amp separable connectors as operating points, involving more-frequent disconnection and reconnection for maintenance, repair, and system revisions led to the development of the connector system shown at the right in Figure 1. It accommodates the necessary additional functional requirements efficiently, as will be described and illustrated in the pages that follow. Just as important, it optimizes the safety for the operator at every step. Safety-engineered connector modifications and hot-stick tools have been devised to simplify and safeguard the accomplishment of all operational functions.

• *Stick-Operable System Components.*



① Insulating Receptacle
② Test Rod
③ Operating Tool
④ Loadbreak Grounding Elbow
⑤ Loadbreak Reducing Tap Plug
⑥ 600-Amp Elbow Connector
⑦ Bushing Extender
⑧ Insulating Bushing
⑨ 600-Amp Apparatus Bushing
⑩ Conductor Contact
⑪ Cable Adapter

LG constantly endeavors to improve our products, so that information in this catalog is subject to change without notice.

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